

WHAT IS CLAIMED:

1. A process for recovering ethane from a hydrocarbon gas stream having methane, ethane and propane comprising:
  - providing the hydrocarbon gas stream;
  - cooling the hydrocarbon gas stream by refrigeration to form a cooled hydrocarbon gas stream;
  - separating the cooled hydrocarbon gas stream into a methane-rich stream and an ethane/propane-rich stream, said methane-rich stream having a first pressure and a first temperature;
  - expanding said methane-rich stream from said first pressure to a second pressure to lower the temperature of said methane-rich stream from said first temperature to a second temperature to provide a cooling source for said refrigeration, wherein said second pressure is lower than said first pressure and further wherein said second temperature is lower than said first temperature;
  - separating said ethane/propane-rich stream into an ethane-rich stream and a propane-rich stream; and
  - recovering said ethane-rich stream.
2. The process of claim 1 wherein said expanding of said methane-rich stream further includes:
  - turboexpanding said methane-rich stream.
3. The process of claim 1 wherein said expanding of said methane-rich stream further includes:
  - compressing said methane-rich stream into a compressed methane-rich stream;
  - cooling said compressed methane-rich stream; and
  - turboexpanding the cooled and compressed methane-rich stream.
4. The process of claim 1 wherein separating said cooled hydrocarbon gas stream further includes:
  - distilling said cooled hydrocarbon gas stream in a demethanizer column.

5. The process of claim 1 wherein separating said ethane/propane-rich stream further includes:
- distilling said ethane/propane-rich stream in a de-ethanizer column.
6. The process of claim 1 wherein said hydrocarbon gas stream contains from about 40% to about 80 % by mole methane, from about 10% to about 50 % by mole ethane and from about 0.5% to about 10 % by mole propane.
7. The process of claim 1 wherein said hydrocarbon gas stream contains from about 50% to about 75 % by mole methane, from about 15% to about 40 % by mole ethane and from about 1% to about 4 % by mole propane.
8. The process of claim 1 wherein said ethane-rich stream contains at least 90 % by mole ethane.
9. The process of claim 1 wherein said ethane-rich stream contains at least 96.5 % by mole ethane.
10. The process of claim 9 wherein said ethane-rich stream contains less than about 0.5 % by mole methane and less than about 3% by mole propane.
11. The process of claim 1 wherein said methane-rich stream contains at least 95% by mole methane.

12. A process for recovering ethane from a methane, ethane and propane containing gas stream comprising:

- providing the hydrocarbon gas stream;
- cooling the hydrocarbon gas stream in a cryogenic heat exchanger to form a cooled hydrocarbon gas stream;
- distilling the cooled hydrocarbon gas stream in a demethanizer column to form a methane-rich stream and an ethane/propane-rich stream;
- compressing said methane-rich stream to form a compressed methane-rich stream;
- cooling said compressed methane-rich stream to form a compressed methane-rich stream;
- turboexpanding said compressed methane-rich stream to a lower pressure to provide a cooling source for said cryogenic heat exchanger;
- distilling said ethane/propane-rich stream in a de-ethanizer column to form an ethane-rich stream and a propane-rich stream; and
- recovering said ethane-rich stream.

13. The process of claim 12 wherein said ethane-rich stream contains at least 96.5 % by mole ethane.

14. A process for providing a methane-rich stream from a hydrocarbon stream containing methane, ethane and propane comprising:

- providing the hydrocarbon gas stream;
- cooling the hydrocarbon gas stream by refrigeration to form a cooled hydrocarbon gas stream;
- separating the cooled hydrocarbon gas stream into a methane-rich stream and an ethane/propane-rich stream, said methane-rich stream having a first pressure and a first temperature;
- expanding said methane-rich stream from said first pressure to a second pressure to lower the temperature of said methane-rich stream from said first temperature to a second temperature to provide a cooling source for said refrigeration, wherein said second pressure is lower than said first pressure and further wherein said second temperature is lower than said first temperature;
- recovering said methane-rich stream.

*[Handwritten signature]* 15. The process of claim 14 wherein said methane-rich stream contains at least 95 % by mole methane.

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